



UPPSC Polytechnic Lecturer

Civil Engineering

Mega Mock Challenge

(December 7th - December 8th 2021)

Questions & Solutions

1. Piezometric head is the sum of
 - A. Velocity head and pressure head
 - B. Pressure head and datum head
 - C. Datum head and velocity head
 - D. Velocity head, pressure head and datum head

Ans. B

Sol. Piezometric head = Pressure head + Datum head

2. If Bernoulli's equation is applied to the pipe flow shown in the figure by neglecting head losses, which of the following statement is most correct?



- A. Pressure head increases from 1 to 2
- B. Pressure head decreases from 1 to 2
- C. Pressure head remains unchanged from 1 to 2
- D. Bernoulli's equation does not include pressure head

Ans. B

Sol. Bernoulli's equation

$$\frac{P}{\rho g} + \frac{v^2}{2g} + z = \text{constant}$$

Where,

$\frac{P}{\rho g}$ = Pressure energy of fluid per unit weight of fluid.

$\frac{v^2}{2g}$ = kinetic energy per unit weight or kinetic head.

Z = potential energy per unit weight or potential head.



Since section 1 and section 2 is at the same level hence $Z_1 = Z_2$

$$\frac{p_1}{\rho g} + \frac{v_1^2}{2g} = \frac{p_2}{\rho g} + \frac{v_2^2}{2g}$$

Using continuity equation (one dimensional flow)

$$A_1V_1 = A_2V_2$$

A_1 = Area At section 1 - 1

V_1 = velocity At section 1 - 1

A_2 = Area At section 2 - 2

V_2 = velocity At section 2 - 2

At sections 1 – 1, the area is more, so velocity is small

At sections 2-2, the area is small so, velocity is more

$$\text{Velocity} \propto \frac{1}{\text{pressure}}$$

$$\frac{v_1^2}{2g} \ll \frac{v_2^2}{2g} \text{ it means } \frac{P_1}{\rho g} \gg \frac{P_2}{\rho g}$$

So, At sections 1-1, the pressure head is more

At sections 2 – 2, the pressure head is small

3. Prandtl's mixing length in a pipe flow is :
- A. a constant
 - B. zero at the pipe wall
 - C. a function of the shear stress at the wall
 - D. a function of the Reynolds number

Ans. B

Sol. • Prandtl karmas maxing theory states that the mixing length is nearly proportional to the distance from the boundary.

• Prandtl's mixing length in a pipe flow is zero at the pipe wall

4. In a turbulent flow through a pipe, the centerline velocity is 3.61 m/s and the friction factor $f=0.02$. The mean velocity of the flow in m/s is :
- A. 4.80
 - B. 3.00
 - C. 2.21
 - D. 0.96

Ans. B

Sol. f =friction factor =0.02

u_{\max} = maximum velocity = centerline velocity is 3.61 m/s

u_{mean} = mean velocity of the flow

$$\frac{u_{\max}}{u_{\text{mean}}} = 1.33\sqrt{f} + 1$$

$$\frac{3.61}{u_{\text{mean}}} = 1.33 \times \sqrt{0.02} + 1$$

$$u_{\text{mean}} = 3.038 \text{ m/s}$$

so closed answer should be B

5. Given that, S_0 = slope of the channel bottom, S_e = slope of the energy line, F = Froude Number, the equation of gradually varied flow is expressed as:

A. $\frac{dy}{dx} = \frac{S_0 - S_e}{1 + F^2}$

B. $\frac{dy}{dx} = \frac{S_0 - S_e}{1 - F^2}$

C. $\frac{dy}{dx} = \frac{S_0 + S_e}{1 + F^2}$

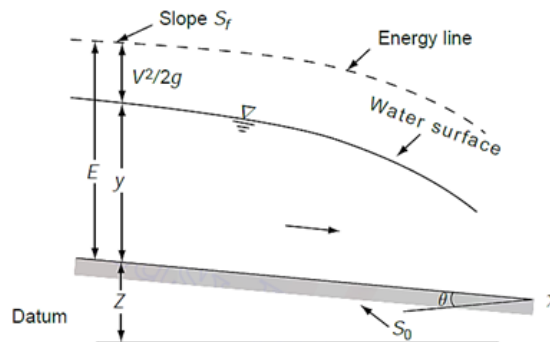
D. $\frac{dy}{dx} = \frac{S_0 + S_e}{1 - F^2}$

Ans. B

Sol. $\frac{dy}{dx} = \frac{S_0 - S_f}{1 - F_r^2}$

S_0 = Bottom slope positive in the downward direction.

S_1 = Friction slope, positive in the downward direction.



6. Streamlining reduces drag primarily by:
- Reducing the wall shear
 - Reducing the pressure in the stagnation region
 - Reducing the separated flow area
 - Eliminating the wake

Ans. C

Sol. Correct option (c)

Streamlining reduces drag by reducing the friction drag which is done by reducing the separated flow area.

7. The variation in the volume of a liquid with the change of pressure is called its:
- Compressibility
 - Surface tension
 - Capillarity
 - Viscosity

Ans. A

Sol. Variation in volume of liquid with the change of pressure is called, its compressibility.

8. For a hydrostatic pressure measurement in fluids at rest
- The shear stress depends upon the coefficient of viscosity
 - The shear stress is maximum on a plane inclined 45° to horizontal
 - The shear stress is zero
 - The shear stress is zero only on horizontal plane

Ans. C

Sol. For fluids, shear stress is given as

$$\tau = \mu \frac{dv}{dy}$$

For fluids at rest $du = 0$, hence $\tau = 0$

9. Poise is the unit of:
- Density
 - Velocity gradient
 - Kinematic viscosity
 - Dynamic viscosity

Equating Reynolds number of model & prototype

$$\left(\frac{VD}{\nu}\right)_{\text{model}} = \left(\frac{VD}{\nu}\right)_{\text{prototype}}$$

$$\frac{V_m}{V_p} = \frac{D_p}{D_m} \times \frac{\nu_m}{\nu_p}$$

$$\left\{ \begin{array}{l} \frac{D_f}{D_m} = \frac{10}{1} \\ \frac{P_m}{P_m} = 1 \end{array} \quad \text{Scale } 10 : 1 \right\}$$

$$\frac{V_m}{V_p} = \frac{10 \times 1.31 \times 10^{-6}}{1.51 \times 10^{-5}}$$

$$V_p = \frac{1.51 \times 10^{-5}}{10 \times 1.31 \times 10^{-6}} \times V_m \quad \{V_m = 5 \text{ m/s}\}$$

$$V_p = 5.76 \text{ m/s}$$

12. Sharper crest of an ogee spillway
- A. Increases the value of coefficient of discharge
 - B. Decreases the effective head
 - C. Increases stability of crest due to hydrostatic pressure
 - D. Has no effect on any one of the above

Ans. A

Sol. Sharper crest of an ogee spillway reduces the frictional resistance and hence coefficient of discharge is increased.

13. The discharge of water through a rectangular channel of width 8 m is 15m³/sec when the depth of flow of water is 1.2 m. The specific energy of the flowing water is
- A. 1.324 m
 - B. 2.824 m
 - C. 3.124 m
 - D. 4.123 m

Ans. A

Sol. Specific energy = $y + \frac{V^2}{2g}$

$$1.2 + \frac{\left(\frac{15}{8 \times 1.2}\right)^2}{2 \times 9.81} = 1.324 \text{ m}$$

14. The critical depth for a channel is given by:

- A. $\left(\frac{q}{g}\right)^{1/2}$
- B. $\left(\frac{q^2}{g}\right)^{1/3}$
- C. $\left(\frac{q^3}{g}\right)^{1/4}$
- D. $\left(\frac{q^4}{g}\right)^{1/5}$

Ans. B

Sol. For critical depth $F_r = 1$

$$\frac{V}{\sqrt{gy_c}} = 1$$

$$\Rightarrow \frac{V}{gy_c} = 1$$

$$q = \frac{Q}{B}$$

$$\Rightarrow V = \frac{Q}{By} = \frac{q}{y}$$

$$\Rightarrow \frac{q^2}{gy_c^3} = 1$$

$$y_c^3 = \frac{q^2}{g}$$

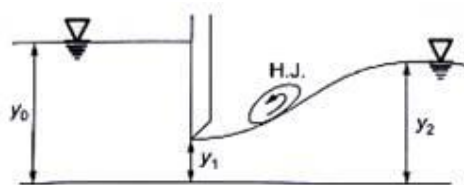
$$y_c = \sqrt[3]{\frac{q^2}{g}} = \left(\frac{q^2}{g}\right)^{1/3}$$

15. The phenomenon occurring in an open channel when a rapidly flowing stream abruptly changes to a slowly flowing stream causing a distinct rise of liquid surface, is :

- A. Water hammer
B. Hydraulic jump
C. Critical discharge
D. None of the above

Ans. B

Sol. Hydraulic jump is the jump or standing wave formed when the depth of flow of water changes from super critical to subcritical state. It is accompanied by loss in energy due to turbulences.



16. A stream having wetted area (A) of 500m² and wetted perimeter (P) of 150m, the hydraulic mean radius in meter is

- A. 650
B. 3.33
C. 0.3
D. 350

Ans. B

Sol. Hydraulic mean radius, $R = \frac{A}{P} = \frac{500m^2}{150m} = 3.33$

17. For a discharge Q, the specific speed of the pump is N_s, For half discharge with the same head, the specific speed will be

- A. N_s
B. N_s√2
C. N_s/√2
D. 2 N_s

Ans. C

Sol.

$$N_{s1} = \frac{N\sqrt{Q}}{H^{3/4}} = N_s$$

$$N_{s2} = \frac{N\sqrt{2}}{H^{3/4}} = \frac{N_s}{\sqrt{2}}$$

18. Small hydroelectric project generates power

- A. <25MW
- B. <100 MW
- C. <550 MW
- D. <1000 MV

Ans. A

Sol. Small hydroelectric project: <25 kW
Medium hydroelectric project: <25-100 kW
Heavy hydroelectric project: >100 kW

19. The power developed by a turbine is:

- A. Directly proportional to $H^{1/2}$
- B. Inversely proportional to $H^{1/2}$
- C. Directly proportional to $H^{3/2}$
- D. Inversely proportional to $H^{3/2}$

Ans. C

Sol. $P = \gamma QH$ and $V = \sqrt{2gH}$

$$P = \gamma (a\sqrt{2gH}) H$$

$$P = k_2 H^{3/2}$$

20. The precipitation that occurs due to the air masses striking natural topographical barriers is called as

- A. Cyclonic precipitation
- B. Convective precipitation
- C. Frontal precipitation
- D. Orographic precipitation

Ans. D

Sol. (1) **Cyclonic precipitation:** It is a type of atmospheric disturbance by mass of air circulating clockwise in southern and anticlockwise in northern hemispheres.

(2) **Convective precipitation:** It is due to the upward movement of warm air. Generally, this type of precipitation occurs in tropical region where in not days, the ground surface is heated inequality and carrying the warmer air to lift up as the cooler air comes to take its place.

(3) **Frontal precipitation:** It is the result of frontal systems surrounding extratropical cyclones or lows, which form when warm and tropical air meets cooler air.

(4) **Orographic precipitation:** This type of precipitation is caused by air masses striking some natural topographic barriers like mountains. As it cannot move forward it rises up causing condensation and precipitation.

21. In groundwater flow, the velocity with which a tracer would move is :

- A. the same as the seepage velocity given by Darcy's law
- B. (1/n) times the seepage velocity where n is the porosity of the formation
- C. (1/e) times the seepage velocity where e is the void ratio of the formation
- D. K times hydraulic gradient (i.e. $v = Ki$) where K is Darcy's coefficient

Ans. B

Sol. Q= Discharge

V= velocity of slow

A= Total cross-section area

$V_s =$ seepage velocity

$A_v =$ Area of voids

n= porosity

$$Q = V \times A \text{-----(1)}$$

Since the flow takes place through voids, the actual velocity is more than the discharge velocity. This actual velocity is called the seepage velocity (v_s). It is defined as the discharge rate of percolating water per unit sectional area of voids (A_v) perpendicular to the flow direction.

$$Q = V_s \times A_v \text{-----(2)}$$

By 1 and 2

$$V_s = V \frac{A}{A_v}$$

Since, $\frac{A_v}{A} = \frac{V_v}{V} = n = \text{porosity}$

$$\therefore V_s = \frac{V}{n}$$

In groundwater flow, the velocity with which a tracer would move is (1/n) times the seepage velocity, where n is the porosity of the formation.

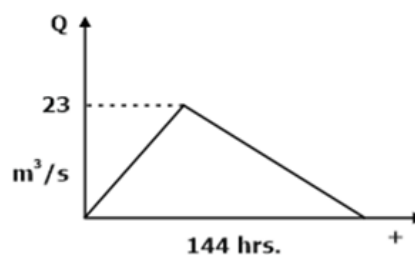
22. The 12-hr unit hydrograph of a catchment is triangular in shape with a base width of 144 hours and a peak discharge value of 23 m³/s. The hydrograph refers to a catchment of area
- | | |
|-----------------------|-------------------------|
| A. 596km ² | B. 1000 km ² |
| C. 25km ² | D. 756 km ² |

Ans. A

Sol. Correct option ; (A) 596km²

Explanation:-

For a given catchment area a triangular 12hr unit hydrograph is considered.



Base, B = 144 hrs.

Peak discharge $Q_{max} = 23m^3/s$

$$\Delta h = \frac{0.36 \Sigma 0t}{A}$$

Where,

$\Sigma 0t$ is sum of area of hydrograph.

A is area in km^2

Δh = depth.

$$1 = 0.36 \times \frac{1}{2} \times \frac{B \times Q_{\max}}{A}$$

$$A = 596 \text{km}^2$$

23. An IUH is a direct runoff hydrograph of
- A. that occurs instantaneously due to a rainfall excess of 1-h duration
 - B. one cm magnitude due to rainfall excess of 1-h duration
 - C. unit rainfall excess precipitating instantaneously over the catchment
 - D. occurring at any instant in long duration

Ans. C

Sol. Correct option (c) unit rainfall excess precipitating instantaneously over the catchment

IUH: Instantaneous unit hydrograph is the hydrograph of rainfall excess (runoff) in which time tends to zero and causes unit depth of rainfall instantaneously.

24. If the wind velocity at a height of 2 m above ground is 5.0 km/h, its value at a height of 9 m above ground can be expected to be in km/h
- A. 10.6
 - B. 9.0
 - C. 2.3
 - D. 6.2

Ans. D

Sol. The wind velocity can be assured to follow 1/7 power law, and can be given by formula

$$v = ch^{1/7}$$

$$\frac{v_1}{v_2} = \frac{ch_1^{1/7}}{ch_2^{1/7}}$$

$$\frac{v_1}{v_2} = \frac{(h_1)^{1/7}}{(h_2)^{1/7}}$$

Given: $v_1 = 50 \text{ km/hr}$, $h_1 = 2\text{m}$

$v_2 = ?$, $h_2 = 9\text{m}$

$$\frac{50}{v_2} = \frac{(2)^{1/7}}{(9)^{1/7}}$$

On solving for v_2

$V_2 = 6.198 \text{ km/hr}$

$V_2 = 6.2 \text{ km/hr}$

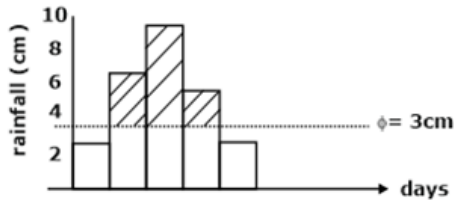
25. The rainfall on five successive days on a catchment was 2, 6, 9, 5 and 3 cm. If the ϕ index for the storm can be assumed to be 3 cm/day, runoff from the catchment is
- A. 10 cm
 - B. 22 cm
 - C. 20 cm
 - D. 11 cm

Ans. D

Sol. Option (D) 11 cm is correct

Rainfall in five successive days – 2,6,9,5 and 3cm

ϕ index = 3cm



run off from the catchment is the shaded regain

$$\text{run off} = 0 + (6 - 3) + (9 - 3) + (5 - 3) + (3 - 3)$$

$$= 3 + 6 + 2 + 0 = 11 \text{ cm}$$

26. An isopluvial line is a line joining points having
- A. Equal evapotranspiration value
 - B. Equal height above the MSL
 - C. Equal rainfall depths
 - D. Equal barometric pressure

Ans. C

Sol. Option (c) is correct

→ ISO-pluvial is a line connecting point of equal rainfall depth

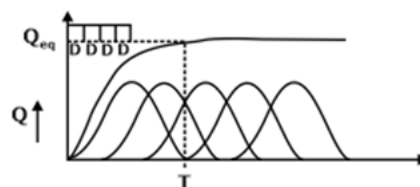
→ Isohyet, Isohyetose, Isohyetal line or Iso pluvial line are all same and defined as a line on a chart joining points of equal precipitation over a specified time period or for a given storm.

27. For a catchment of area A an S-curve has been derived by using the D-hour unit hydrograph which has a time base T. In this S-curve
- A. The time at which the S-curve attains its maximum value is equal to D
 - B. The time at which the S-curve attains its maximum value is equal to T
 - C. The equilibrium discharge is independent of A
 - D. The equilibrium discharge is independent of D

Ans. B

Sol. Correct option (B) The lime at which S curve attain its maximum value is equal to.7.

Explanation;



S-curve hydrograph is obtained if there is a continuous effective rainfall at a constant rate goes on for an indefinite time.

$$Q_{eq} = \frac{2.18A}{D}, \text{ which depends upon } A \text{ \& \& } D.$$

And it attains its maximum value Q_{eq} at a time equal to the base time T of the constituent unit hydrographs.

28. The stage in a river is 4.8 m, the water surface slope is 1 in 19600 and the discharge in the stream is 450 m³/s. If the stage remains the same and the water surface slope is 1 in 22500, then the discharge in the stream will be

- A. 420 m³/s
- B. 450 m³/s
- C. 400 m³/s
- D. 120 m³/s

Ans. A

Sol. Manning formula

$$Q = \frac{A}{n} R^{2/3} \sqrt{S}$$

$$\frac{Q_1}{\sqrt{S_1}} = \frac{Q_2}{\sqrt{S_2}}$$

$$\frac{450}{\sqrt{\frac{1}{19600}}} = \frac{Q_2}{\sqrt{\frac{1}{22500}}}$$

$$Q_2 = 420 \text{ m}^3/\text{sec}.$$

29. The plot between rainfall intensity V/s time is called as:

- A. Hyetograph
- B. Isohyets
- C. Hydrograph
- D. Mass curve

Ans. A

Sol. The plot between rainfall intensity V/s time is called as hyetograph.

30. Rainfall of intensity of 20 mm/h occurred over a watershed of area 100 ha for a duration of 6 hours. Measured direct runoff volume in the stream draining the watershed was found to be 30000 m³. The precipitation not available to runoff in this case is:

- A. 10 cm
- B. 90 cm
- C. 9 cm
- D. 5 cm

Ans. C

Sol. total rainfall in terms of volume = 0.020 * 6 * 100 * 10000 = 120000 m³

$$\text{Precipitation not available to runoff} = 120000 - 30000 = 90000 \text{ m}^3$$

$$\text{Precipitation depth not available to runoff} = \frac{90000}{100 * 10000} = 0.09 \text{ m} = 9 \text{ cm}$$

31. Instantaneous unit hydrograph is a hydrograph of

- A. unit duration
- B. unit rainfall excess infinitely small duration
- C. unit rainfall excess infinitely long duration
- D. zero effective rainfall

Ans. B

Sol. Instantaneous UH – A UH for infinitesimally small duration

32. The Bligh's creep coefficient for light sand and mud is:

- A. 18
- B. 25
- C. 10
- D. 20

Ans. A

33. As per the 'bandhara irrigation scheme', the discharge formula used for a bandhara weir is:

- A. $1.7L H^{2.5} \text{Cumec}$
- B. $1.7L H^{1.5} \text{Cumec}$
- C. $2.7L H^{1.5} \text{Cumec}$
- D. $1.7 H^{1.5} \text{Cumec}$

Ans. B

34. Cross regulators in main canals are provided

- A. To regulate water supply in the distributaries
- B. To increase water head upstream when a main canal is running with low supplies
- C. To overflow excessive flow water
- D. None of the above

Ans. A

Sol. Cross regulars in main canals are provided to regulate water supply in distributaries. Canal escape is providing to release excess water.

35. The bottom portion of concrete or a masonry gravity dam is usually stepped, in order to :

- A. increase the overturning resistance of the dam
- B. increase the shear strength of the base of the dam
- C. decrease the shear stress at the base of the dam
- D. there would be no effect

Ans. B

Sol. • The foundation is stepped at the base to increase the shear strength at the base and other joints.

- Measures are taken to ensure a better bond between the dam and the rock foundation.
- By ensuring a better bond between the surface, the shear strength of these joints should be made as good as possible.

36. In a gravity dam, the total farce due to wave pressure acts at the heights of Above still water level.

- A. $0.375 h_w$
- B. $0.500 h_w$
- C. $0.935 h_w$
- D. $0.665 h_w$

Ans. A

Sol. Total farce due to wave pressure acts at the height of $0.375h_w$ above still water. Where h_w is the height of wave.

$$h_w = 0.032 \sqrt{VF} \quad F > 32\text{km}$$

F = fetch of reservoir

$H_w = (m)$

V = wind velocity (km/hr)

37. As per IS 10430-2000, the range of rugosity coefficient of a brick-tile-lined canal is:
- A. 0.18-0.20
 - B. 0.018-0.020
 - C. 0.001-0.0013
 - D. 0.00001-0.0002

Ans. B

Sol.

Material:	Rugosity coeff.
Rubbli masonry	0-017-0.022
Brick-tile lined	0.018-0.02
Natural streams	0.03-0.04
Concrete channel	0.011-0.015

38. Kharif crop are also called:
- A. Spring crops
 - B. Monsoon crops
 - C. Winter crops
 - D. Summer crops

Ans. B

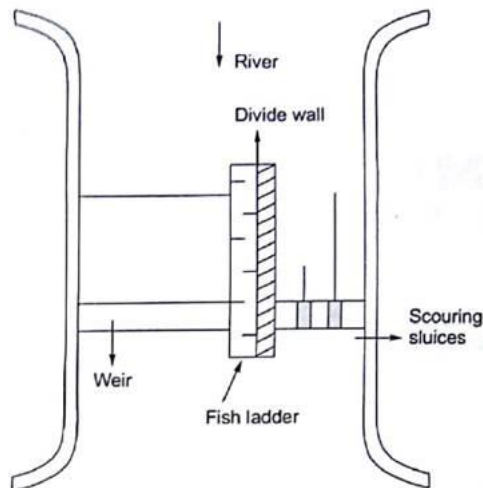
Sol. Kharif crops → Monsoon crops

Rabi crops → Winter crops.

39. A divide wall is provided
- A. At right angle to the axis of weir
 - B. Parallel to the axis of weir and upstream of it
 - C. Parallel to the axis of weir and downstream of it
 - D. At an inclination to the axis of weir

Ans. A

Sol. Components of diversion head works.



40. Which of the following spillways is least suitable for an earthen dam?
- A. Ogee spillway
 - B. Chute spillway
 - C. Side channel spillway
 - D. Shaft spillway

Ans. A

Sol. In this, energy losses are minimal and hence high velocity is maintained. Therefore it is not suitable for earthen dam.

41. As per IRC (Indian Road Congress), the maximum possible width of a vehicle will be
- A. 2.44 m
 - B. 3.44 m
 - C. 1.88 m
 - D. 4.0 m

Ans. A

Sol. According to IRC-003 clause (5.1)

— No vehicle shall have a width exceeding 2.44 m.

— No vehicle other than double decker bus shall have a height exceeding 3.8 m for normal application, however for double decker buses, have a height not exceeding 4.75 m.

42. If V is speed in km/hr. and R is radius of the curve, the super-elevation 'e' is equal to
- A. $V^2/125R$
 - B. $V^2/225R$
 - C. $V^2/325R$
 - D. $V^2/25R$

Ans. B

Sol. In mixed traffic condition

$$\text{Super-elevation} = e = \frac{v^2}{225R}$$

43. The question consists of two statements; one labelled as 'Assertion (A)' and the other as 'Reason (R)'.

Assertion (A): For mixed traffic conditions, the superelevation should fully counteract the centrifugal force for the full design speed.

Reason (R): Superelevation needed to maintain the design speed in fully may exceed the limiting value 0.07. Further, as it not possible to increase the radius, the speed has to be restricted.

Examine above two statements carefully and select the correct answer from the options given below :

- A. Both (A) and (R) are true and (R) is the correct explanation of (A)
- B. Both (A) and (R) are true and (R) is not a correct explanation of (A)
- C. (A) is true but (R) is false
- D. (A) is false but (R) is true

Ans. D

Sol. IRC suggest the following procedure for the design of superelevation

I. Find e for 75% of design speed neglecting friction.

II. If e is less than 7%, then it is provided. If $e > 7\%$, then

III. Find f for max e.

IV. Find alternative speed.

44. Design of horizontal curves on highways, is based on
- A. Design speed of vehicles
 - B. Permissible friction on the road surface
 - C. Permissible centrifugal ratio
 - D. All the above

Ans. D

Sol. Design of horizontal curve on highways is based on

- i) Design speed of vehicle

- ii) Permissible friction on road surface
- iii) Permissible centrifugal ratio
- iv) Permissible maximum super elevation.

Option (d) All of the above is correct.

45. The co-efficient of average rolling friction of a road is f_r and its grade is $+G\%$. If the grade of this road is doubled, what will be the percentage change in the braking distance (for the design vehicle to come to a stop) measured along the horizontal (assume all other parameters are kept unchanged) ?
- A. $0.01 G \times 100/(f_r + 0.02G)$
 - B. $0.01 G \times 100/(f_r + 0.01G)$
 - C. $2 f_r \times 100/(f_r + 0.01G)$
 - D. None of these

Ans. A

Sol. $\frac{0.01G \times 100}{(f_r + 0.02G)}$

46. What is the value of resultant retardation in m/s^2 when a longitudinal friction coefficient of 0.36 is allowed for stopping the vehicle on road?
- A. 1.24
 - B. 1.82
 - C. 2.24
 - D. 3.53

Ans. D

Sol. $a = \mu g$
 $= 0.36 \times 9.81 m/s^2$
 $= 3.53 m/s^2$

47. Average free flow speed and the jam density observed on a road stretch are 80 km/h and 100 vehicles/km respectively. For a linear speed-density relationship, the maximum flow on the road stretch (in vehicles/h) is:
- A. 8000 veh/hour
 - B. 2000 veh/hour
 - C. 1800 veh/hour
 - D. 2200 veh/hour

Ans. B

Sol. $q = U_{sf} \cdot k_j / 4 = 80 \cdot 100 / 4 = 2000 \text{ Veh/hr.}$

48. Which of the following is true in case of railway track maintenance?
- A. Shovel is used to lift rail while Rail tongs is used to handle ballast
 - B. Rail tongs is used to lift rail while Shovel is used to handle ballast
 - C. Shovel can be used to correct track alignment as well as to lift rail
 - D. Rail tongs can be used to handle ballast as well as to remove dog spikes

Ans. B

Sol. Rail tongs are used to lift rails. They are designed to handle all standard size rails. Tongs are provided with no slip machined diamond face gripping pads. Shovel is a tool used for lifting and moving small material. In railways it is used to handle ballast.

49. Map cracking is the common type of failure in
- A. Rigid pavements
 - B. Cement concrete pavements
 - C. Gravel roads
 - D. Bituminous surfacing

Ans. D

Sol. Map cracking occurs in bituminous surfacing.

50. Beaufort Scale is used to determine

- A. Strength of winds
- B. Direction of winds
- C. Height of aircrafts
- D. None of these

Ans. A

Sol. The Beaufort scale is an empirical measure that states wind speed to observed conditions at sea or on land. Its full name is the Beaufort wind force scale.

51. The diagram which shows all important physical conditions of an accident location like roadway limits, bridges, trees and all details of roadway conditions is known as

- A. Pie Chart
- B. Spot Maps
- C. Condition Diagram
- D. Collision Diagram

Ans. C

Sol. A condition diagram is a scale drawing which provides a picture of the physical conditions present at the location under study.

52. The temperature at which ductility test is conducted is

- A. 25°C
- B. 50°C
- C. 20°C
- D. 27°C

Ans. D

Sol. The ductility test is conducted at 27°C.

53. The basic runways length should be increased at the rate of X percent per Y m rise in elevation above mean sea level, where

- A. X = 6; Y = 200
- B. X = 7; Y = 300
- C. X = 7; Y = 200
- D. X = 6; Y = 300

Ans. B

Sol. Elevation correction for basic runway length is applied as runway length be increased by 7% for every 300 m elevation from MSL.

54. Among various stages of survey in highway alignment, the correct sequence is

- A. reconnaissance, map study, and preliminary survey
- B. reconnaissance, map study, and detailed survey
- C. map study, reconnaissance, preliminary survey and detailed survey
- D. None of these are correct

Ans. C

Sol. For any survey of a highway alignment, correct order of study is

- i. Map study
- ii. Reconnaissance survey
- iii. Preliminary survey and
- iv. Detailed survey

55. Desire lines are plotted in
- A. Origin and destination studies
 - B. Speed studies
 - C. Axle load studies
 - D. None of these are correct

Ans. A

Sol. Desire lines are the lines plotted where the movement of traffic is more. These lines are plotted in origin and destination studies and show the potential movement of the traffic. Desire lines are used to plan the development of new roads.

56. The maximum utility system is based on the concept of
- A. Maximum utility per unit cost of road
 - B. Maximum utility per unit length of road
 - C. Maximum utility per unit population
 - D. None of the above

Ans. B

Sol. Maximum utility system is based on the concept of maximum utility per length of road. To choose from different alternatives of road projects, utility units are given to different alternatives based on (1) population and (2) productivity. The combined utility units are then divided by the road length. The alternative with highest value is taken up.

57. The Benkelman Beam Deflection method is used for
- A. Flexible overlay on flexible pavement
 - B. Rigid overlay on rigid pavement
 - C. Flexible overlay on rigid pavement
 - D. Rigid overlay on flexible pavement

Ans. A

Sol. Benkelman Beam Deflection test rebound deflection of pavement under a standard wheel load and tyre pressure. Pavement deteriorates functionally and structurally with time due to traffic loading. Hence a flexible overlay is provided over the existing flexible pavement to strengthen it.

58. _____ loading is adopted on all roads on which permanent bridges and culverts are constructed.
- A. IRC Class A
 - B. IRC Class AA
 - C. IRC Class B
 - D. IRC Class AB

Ans. A

Sol. IRC class A loading is adopted on all roads on which permanent bridge and culverts are constructed.

59. One degree of curve is (where R = Radius of curve):
- A. $1700/R$
 - B. $1750/R$
 - C. $1720/R$
 - D. None of these

Ans. C

Sol. One degree of curve is (where R = Radius of curve) for 30 m Chain is $1720/R$.

60. "Composite Sleeper Index" is employed to determine
- A. Sleeper density requirement
 - B. Number of fixtures requirement for a particular type of sleeper
 - C. Durability of sleeper
 - D. Mechanical strength of wooden sleepers, and thereby, gives its suitability to be used as sleepers

Ans. D

Sol. Composite sleeper index (CSI): It is evolved from a combination of the properties of strength and hardness. It is an index used to determine the suitability of a particular timber for use as a sleeper from the point of view of mechanical strength.

$$CSI = (S + 10H)/20$$

S = Strength index

H = Hardness index

61. The reception signal is
- A. Advanced starter only
 - B. Starter only
 - C. None of the other options provided
 - D. Both Advanced starter and Starter

Ans. C

Sol. Reception signals → Other and home signals

Departure signals → Starter and advance starter signals

62. Choice of gauge depends on
- A. volume of traffic only
 - B. speed of train only
 - C. neither (volume of traffic) nor (speed of train)
 - D. both (volume of traffic) and (speed of train)

Ans. D

Sol. For large volume or large speed, broad gauge is used and vice versa.

63. For all parts of bridge floors accessible only to pedestrians and for all footways, loading should be
- A. 200 kg/m²
 - B. 300 kg/m²
 - C. 400 kg/m²
 - D. 500 kg/m²

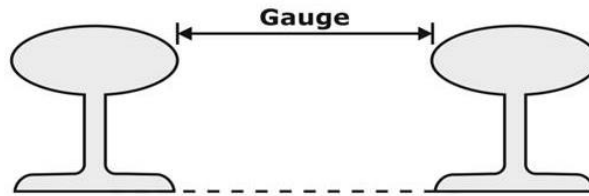
Ans. C

Sol. According IS code guidelines, for all parts of bridge floors accessible only to pedestrians and for all footways, loading should be taken as 400 kg/m².

64. The gauge of a railway track is defined as:
- A. The clear distance between inner faces of two rails
 - B. The clear distance between outer faces of two rails
 - C. The centre to centre distance between two rails
 - D. The distance between inner faces of a pair of wheels

Ans. A

Sol. Gauge of a railway track is defined as the clear distance between inner faces of two rails.



65. Excessive nitrate in drinking water causes

- A. Colour blindness
- B. Fluorosis
- C. Methemoglobinemia
- D. Rickets

Ans. C

Sol. Nitrate is a compound that naturally occurs. And has many natural sources. Consuming too much nitrate can affect how blood carries oxygen and can cause 'methemoglobinemia' also known as blue baby syndrome.

* Methemoglobinemia can cause skin to turn a bluish color and can result in serious illness or death.

66. Which of the following is common, when a valve closes suddenly at an end of a pipeline system, and a pressure wave propagates in the pipe?

- A. Expansion
- B. Contraction
- C. Water hammer
- D. Turbulent flow

Ans. C

Sol. *Water hammer is a pressure surge or wave caused when a fluid (usually a liquid but sometimes also in gas) in motion is forced to stop or change direction suddenly.

* A water hammer is generally occurring when a valve closes suddenly at an end of piping system, and a pressure wave propagates in the pipe. It is also called hydraulic shock.

* The pressure wave can also generate other problems like noise and vibrations.

67. Which of the following processes of softening water may require recarbonation?

- A. Lime soda process
- B. Sodium cation exchange process
- C. Demineralisation process
- D. Hydrogen cation exchange process

Ans. A

Sol. Lime soda process of softening water may require recarbonation.

68. When chlorine is added beyond the break-point, the process of treating the water is known as

- A. post-chlorination
- B. plain chlorination
- C. super-chlorination
- D. dichlorination

Ans. C

Sol. Option (c) super chlorination

A) post chlorination: It is a treatment process that occur before water leaves the treatment plant

B) Plain chlorination: It indicates the only chlorine treatment and no other treatment given to raw water.

C) super chlorination: In this process chlorine is applied beyond the stage of break point.

D) Dichlorination: It is a process of removing residual chlorine from disinfect wastewater prior to discharge into the environment.

69. During which of the following operating conditions of an automobile is carbon monoxide content in the exhaust gas the minimum?
- A. Idle running
 - B. Acceleration
 - C. Cruising
 - D. Deceleration

Ans. A

Sol. During idle running carbon monoxide level in the exhaust gas is minimum.

70. Rapid sand filter can remove turbidity from water to an extent of
- A. 35 to 40 ppm
 - B. 40 to 50 ppm.
 - C. 20 to 25 ppm
 - D. 15 to 20 ppm

Ans. A

Sol. Rapid sand filter can remove turbidity
Upto 35 to 40 ppm.

So correct option is (A) 35-40 ppm.

71. A waste water stream (flow = 3 m³/s, ultimate BOD = 80 mg/l) is joining a small river (flow = 12 m³/s, ultimate BOD = 10 mg/l). Both water streams get mixed up instantaneously. Cross-sectional area of the river is 30.0 m². Then the velocity of river flow will be:
- A. 0.3 m/s
 - B. 0.5 m/s
 - C. 1.5 m/s
 - D. None of these

Ans. B

Sol. $Q = 12 + 3 = 15 \text{ m}^3/\text{s}$
 $V = Q/A = 15/30 = 0.5 \text{ m/s}$

72. If the specific gravity of grit is 2.8, the particle size is 0.25 mm, and the viscosity of water is $1 \times 10^{-2} \text{ m}^2/\text{s}$, assuming the Stokes' Law to be valid, the settling velocity of grit particles will be (Take $g = 10 \text{ m/s}^2$):
- A. 12.5 m/s
 - B. 6.25 m/s
 - C. 3.125 m/s
 - D. 1.5625 m/s

Ans. B

Sol. setting velocity of particle of size less than 1mm, v
 $= g(G-1)d^2 / (18 \times \nu)$
 $= (10 \times 1.8 \times 0.25^2) / (18 \times 0.01) = 6.25 \text{ m/s}$

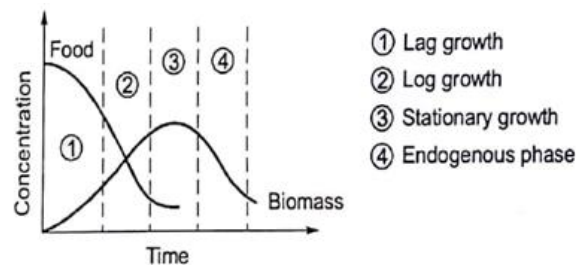
73. Ground water contaminated with TCE is treated with powdered activated carbon by adsorption (isotherm : $Q_{eq} = 129(C_{eq})^{0.73}$ where Q_{eq} is mass of TCE adsorbed on PAC (mg/mg PAC); C_{eq} is concentration of dissolved TCE in water (mg/L)). If TCE concentration in water is 1 mg/L, what mass concentration of PAC must be used (mg PAC/L water) to reduce TCE concentration to 0.005 mg/L?
- A. 0.3690 mg/L
 - B. 0.45 mg/L
 - C. 0.35 mg/L
 - D. 0.40 mg/L

Ans. A

76. Select the correct sequence of different phases of biomass curve:
- A. Lag phase → Log growth phase → stationery phase → endogenous phase
 - B. Lag phase → endogenous phase → stationery phase → log growth phase
 - C. Endogenous phase → Lag phase → stationery phase → Log growth phase
 - D. Log growth phase → Lag phase → endogenous phase → stationery phase

Ans. A

Sol.



77. Calculate contribution of removal of phosphorous in primary settling tank to overall removal in wastewater treatment plant? Plant schematic is: influent water → Primary settling tank → Biological aeration tank → Secondary settling tank → Effluent water.

Parameter	Influent water	After settling (i.e. influent to aeration tank)	Effluent water
Phosphorous	7 mg/L	6 mg/L	5 mg/L

- A. 40%
- B. 45%
- C. 50%
- D. 52%

Ans. C

Sol. Total removal of phosphorus

$$= (7 - 5) \text{ mg/L} = 2 \text{ mg/L}$$

Removal of phosphorous by primary setting tanks

$$= (7 - 6) \text{ mg/L} = 1 \text{ mg/L}$$

%age contribution of removal by PST in overall removal

$$= \frac{1}{2} \times 100 = 50\%$$

78. As per IS 10500, acceptable limit for chlorides in mg/l in drinking water is
- A. 100 mg/l
 - B. 250 mg/l
 - C. 500 mg/l
 - D. 1500 mg/l

Ans. B

Sol. According to IS 10500 acceptable limit for chlorides in drinking water is 250 mg/l and cause for rejection level is 1000 mg/l.

79. The standard unit of turbidity of water is that which is produced by 1 mg of _____ dissolved in one litre of distilled water.
- A. Finely divided silica
 - B. Platinum cobalt
 - C. Potassium permanganate
 - D. Formazin

Ans. A

Sol. Turbidity is the measure of extent to which light is either absorbed or scattered by suspended material in water.

Turbidity which 1 mg of finely divided silica produces in one litre of distilled water is taken as 1 unit. It is termed as NTU, nephlo meter turbidity unit.

80. The system designed to capture, store, manipulate, analyze, manage and present spatial or geographical data can be termed as
- | | |
|-------------|---------------|
| A. GIS | B. GPS |
| C. Contours | D. Topography |

Ans. A

Sol. GIS: A geographical information system is a computer system for capturing, storing, checking and displaying data related to positions on earth's surface.

Any relating seemingly unrelated data. GIS can help in better under standing of spatial patterns and relationships.

81. Theodolite is used to measure
- | | |
|--|-------------------------------------|
| A. Horizontal angle and vertical angle | B. Horizontal and vertical distance |
| C. RL at a point | D. None of the above |

Ans. A

Sol. **Concept:** It is a measurement instrument reutilizing in surveying to determine horizontal and vertical angles with the ting low telescope that may move within the horizontal and vertical planes.

82. An imaginary line joining the points of equal elevation on the surface of the Earth represents
- | | |
|---------------------|--------------------|
| A. Contour gradient | B. Contour surface |
| C. Contour line | D. Level line |

Ans. C

Sol. **Concept:**

1. Contour gradient: A line marked on the ground surface at a given constant scope.
2. Contour surface: It is a graphical technique for representing a 3-dimensinal surface by plotting constant Z slices, called contours, on a z-dimensional format.
3. Counter line: It is a line on map joining points of equal heights above or below sea level.
4. Level line: A line lying in a level surface is a level line.

So, an imaginary line joining the points of equal elevation on the surface of the earth represents a counter line.

83. The operation of revolving a plane table about its vertical axis so that all lines on the sheet become parallel to corresponding lines on the ground is known as
- | | |
|----------------|--------------|
| A. Levelling | B. Centering |
| C. Orientation | D. Setting |

Ans. C

Sol. 1. Levelling: It is a process of determining the height of one level relative to another.

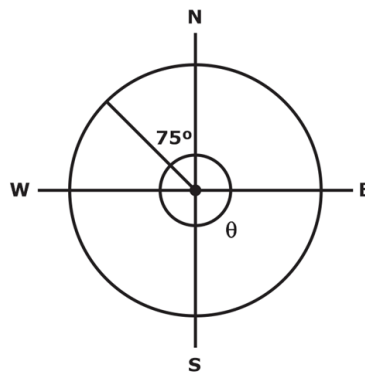
2. Centering: Centering means bringing the vertical axis of the theodolite exacting over the station marks.
3. Orientation: The method of setting up the plane table at each of the successive station parallel to the position it occupied at the starting station is known as orientation.
4. Setting: Setting out means defining the location size and shape of civil engineering project; e.g.: housing e-state, a road, a bridge.

The operation of revolving a plane table about its vertical axis so that all lines on the sheet becomes parallel to corresponding lines on the ground is known as orientation.

84. The reduced bearing of a line is N 75° W. Its whole circle bearing is
- | | |
|--------|---------|
| A. 75° | B. 95° |
| C. 15° | D. 285° |

Ans. D

Sol. Given, reduce bearing of a line is N 75°W.



$$\text{Whole circle bearing} = \theta = 360 - 75^\circ = 285^\circ$$

85. Consider the following assumptions of Bowditch method:
- 1) Angular measurements are more precise than linear measurements
 - 2) Linear measurements are more precise than angular measurements
 - 3) Error in linear measurements are proportional to square root of its length.
 - 4) Correction to latitude or departure of any side

$$= \text{Total error in L (or) D} \times \text{length of the line/perimeter of the traverse}$$

Which of these statements are correct?

- | | |
|---------------|---------------|
| A. 3 and 4 | B. 1, 2 and 3 |
| C. 2, 3 and 4 | D. 1 and 3 |

Ans. A

Sol. Assumptions of Bowditch method.

→ Angular & linear measurements taken as some precision.

→ Errors in linear measurement is directly proportional to \sqrt{l} .

→ Errors in angular measurement are inversely proportional to \sqrt{l} .

→ Correction to attitude or departure of any side

$$= \text{Total error in L or D} \times \left(\frac{\text{length of that side}}{\text{perimeter of traverse}} \right)$$

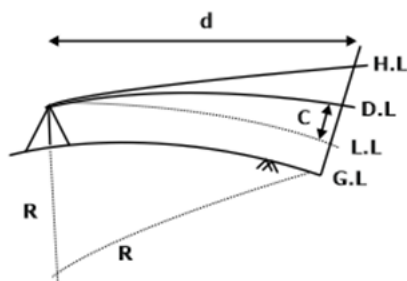
So, option (A) is correct

86. The combined correction due to curvature and refraction (in m) for distance of 1 km on the surface of the earth is _____.

- A. 0.763
C. 7.63
B. 0.673
D. 0.0673

Ans. D

Sol. Correct option is (d) 0.0673



⇒ Correction due to Earth curvature

$$C_C = \frac{d^2}{2R}$$

$$= \left(\frac{d^2}{2 \times 6370} \right) \times 1000 = 0.0785d^2$$

Which is always negative

⇒ Refraction correction is considered as $\frac{1}{7} C_C$

$$C_R = \frac{1}{7} C_C$$

Always positive.

Total correction $C = -C_C + C_R$

$$= -0.0785d^2 + \frac{1}{7} \times 0.0785d^2$$

$$= 0.0673d^2$$

For $d = 1\text{Km}$

$$\boxed{C = 0.0673}$$

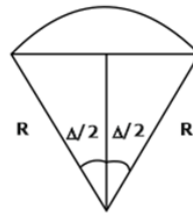
87. If a radius of a circular curve is 100 m, deflection angle is 90° , the length of long chord is _____.

- A. Zero
C. infinity
B. 100 m
D. 141.42 m

Ans. D

Sol. Correct option (d) 141.42

Given:-



Radius of circular curve = 100m

Deflection angle = $\Delta = 90^\circ$

Length of lang chord = ?

$$L = 2R \sin \frac{\Delta}{2}$$

$$= 2 \times 100 \times \sin \left(\frac{90^\circ}{2} \right)$$

$$= 2 \times 100 \times \frac{1}{\sqrt{2}} = 141.42\text{m}$$

$$\boxed{L = 141.42\text{m}}$$

88. The propose of Alidade in plane table surveying is:

- A. Sighting to target points
- B. cantering
- C. levelling the plane table
- D. eliminating parallax

Ans. A

Sol. Alidade is device used to sight to observation /target to points & to mark the line on the plane while surveying

89. In permanent adjustment of levels, two peg test is done to correct or adjust:

- A. Level tube
- B. Cross-hair ring and Line of collimation both
- C. Cross-hair ring
- D. Line of collimation

Ans. D

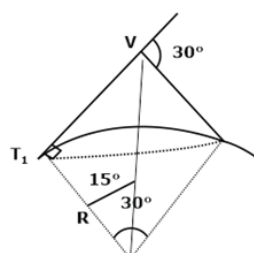
Sol. Tow peg test is done to correct/adjust Line of collimation.

90. A circular curve of radius R connects two points of tangent. What is the length of the tangent if the angle of deflection is 30° ?

- A. 0.27R
- B. 0.115R
- C. 0.78R
- D. 0.58R

Ans. A

Sol.



$$\tan\left(\frac{\Delta}{2}\right) \Rightarrow \frac{VT_1}{R}$$

$$\text{Length of } VT_1 = R \tan\left(\frac{\Delta}{2}\right) \Rightarrow R \tan\left(\frac{30}{2}\right) \text{ tangent}$$

$$= 0.2679R$$

$$= 0.27R$$

91. The maximum permissible tolerance in a 20m chain is:

- A. ±5mm
- B. ±15mm
- C. ±10mm
- D. ±20mm

Ans. A

Sol.

Maximum tolerance	Chain size
±3mm	10m
±5mm	20m
±8mm	30m

92. In determining the area of the curved boundary rule is used to get accurate results.

- A. Trapezoidal
- B. Mid-ordinate
- C. Average ordinate
- D. Simpson's

Ans. D

Sol. According to options in ques. most accurate among them is Simpson's rule to find area of curved boundary.

93. Which of the following conditions require Geodetic Surveying?

- A. Reconnaissance Survey
- B. Survey of the Country
- C. Horizontal Curve Ranging
- D. Vertical Curve Ranging

Ans. B

Sol. In survey of the country curvature of the earth is accounted for hence geodetic survey is required.

94. The maximum tolerance in overall length of a 20 m and 30 m metric chain should be respectively

- A. ± 2 mm, ± 8 mm
- B. ± 3 mm, ± 5 mm
- C. ± 5 mm, ± 8 mm
- D. ± 8 mm, ± 5 mm

Ans. C

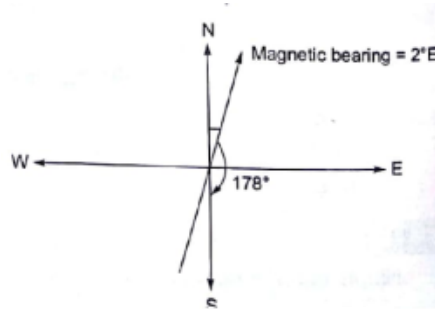
Sol. The overall tolerances allowed in a 20m chain is ±5mm and that in a 30m chain ±8mm

95. The magnetic bearing of the sun at noon is 178°. The magnetic declination at the place is

- A. 2° W
- B. 2° E
- C. 2° N
- D. 2° S

Ans. B

Sol.



96. The line joining the optical centre of object glass to the centre of eye-piece of a telescope is
- A. Line of collimation
B. Line of sight
C. Axis of bubble tube
D. Axis of telescope

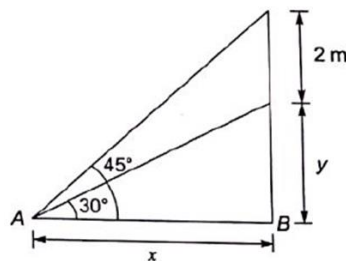
Ans. D

Sol. Axis of telescope-line joining the optical centre of the eyepiece. Axis of level tube-an imaginary line tangential to the longitudinal curve of the tube at its mid point. Line of collimation-line joining the intersection of the cross hairs to the optical centre of the objective. It is also known as line of sight.

97. The angles of elevation from A to the top and bottom of a road of length 2 m held vertically at B are 45° and 30° respectively. The horizontal distance AB is:
- A. 4.732 m
B. 1.268 m
C. 3.464 m
D. 0.789 m

Ans. A

Sol.



$$\tan 30^\circ = \frac{y}{x} = \frac{1}{\sqrt{3}}$$

$$\tan 45^\circ = 1 = \frac{y+2}{x}$$

$$\Rightarrow x = y + 2$$

$$\frac{y}{y+2} = \frac{1}{\sqrt{3}}$$

$$\Rightarrow 1 + \frac{2}{y} = \sqrt{3} \Rightarrow y = 2.732m$$

$$x = y + 2 = 4.732m$$

98. Remote sensing work where system has no energy source of its own but depends on external source of energy is called

- A. Active remote sensing
- B. Passive remote sensing
- C. SLAR
- D. LIDAR

Ans. B

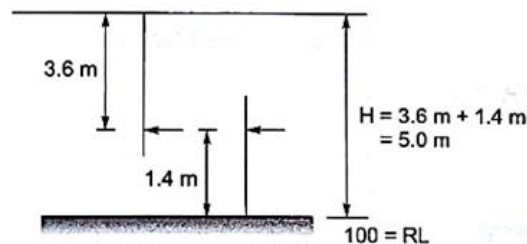
Sol. In passive remote sensing we don't have an energy source of our own but use external source as energy of eg. Sun.

99. The RL of the floor in a building is 100.00 m and the staff reading on the floor is 1.40 m. If the reading on the staff when held inverted with bottom touching the T-Beam of the slab is 3.60 m, then the height of the T-Beam bottom above the floor is equal to

- A. 2.20 m
- B. 2.50 m
- C. 5 m
- D. 95 m

Ans. C

Sol.



100. Agonic line is the

- A. line connecting same declination
- B. line connecting zero declination
- C. line connecting max and min declination
- D. line connecting zero dip

Ans. B

Sol. Agonic line – line connecting zero declination

Isogonic line – line connecting same declination

Aclinic line – line connecting zero dip

Isoclinic line – line connecting same dip

101. Which country will host the AFC Women's Asian Cup in 2022?

- A. Sri Lanka
- B. Japan
- C. India
- D. China
- E. Indonesia

Ans. C

Sol. • As per the announcement made by the Asian Football Confederation the 2022 Women's Asian Cup, to be hosted by India, will be held from January 20 to February 6.

• The tournament will feature 12 teams, expanded from eight in the previous edition, comprising three groups of four with a minimum of 25 matches being played over 18 days. Eight teams will qualify for the newly-introduced quarterfinals.

- The event will also serve as a qualification tournament for the 2023 FIFA Women's World Cup, which will see a record five Asian teams seal their spots to join co-host Australia for the newly-expanded 32-team global showpiece.

102. What is the budget outlay for the production-linked incentive (PLI) scheme for telecommunications (telecom) and networking products, launched by government of India, over five years?

- A. Rs 8,595 crore
- B. Rs 10,295 crore
- C. Rs 11,795 crore
- D. Rs 12,195 crore
- E. Rs 15,195 crore

Ans. D

Sol. • Government of India has launched the scheme for telecommunications and networking products, with an outlay of Rs 12,195 crore over five years.

- The scheme will be operational from 1st April 2021.
- Under the PLI scheme, Telecom manufacturing will be boosted in order to enhance the production of more than Rs 2.4 lakh crore.
- The scheme also has higher proposed incentives for micro, small and medium enterprises (MSMEs).
- For MSMEs, the government has proposed a 1 per cent higher incentive in the first three years. The minimum investment threshold for MSMEs has been kept at Rs 10 crore; for others, at Rs 100 crore.
- The PLI scheme was launched in March 2020 in a bid to boost domestic manufacturing.

103. What is the strike range of the new variant of nuclear-capable Agni P missile test fired by Defence Research and Development Organisation (DRDO) successfully off Odisha coast?

- A. 700 km - 1000 km
- B. 1000 km - 1500 km
- C. 1000 km - 2000 km
- D. 2000 km - 3000 km
- E. 3000 km - 5000 km

Ans. C

Sol. • India successfully test-fired a brand new missile in its most ambitious Agni series from a defense facility off Odisha coast.

- The first test of the new generation nuclear-capable ballistic missile Agni Prime was conducted from the launching complex IV of Abdul Kalam Island.
- Indigenously developed by Defence Research and Development Organisation (DRDO), the missile met all mission objectives.
- Agni P is the latest and most advanced variant of the Agni class of missiles.
- It is a canisterised missile with a range capability between 1000 km and 2000 km.

104. Who has been conferred with Ashok Chakra by the President of India on the occasion of 75th Independence Day?

- A. Babu Ram
- B. Altaf Hussain
- C. Arun Kumar
- D. Arun Kumar Pandey
- E. Ravi Kumar Chaudhary

Ans. A

Sol. • President Ram Nath Kovind has conferred 144 Gallantry awards to armed forces, police and paramilitary personnel on the occasion of Independence Day 2021.

- Awards includes:
 - Ashok Chakra - Babu Ram (posthumously)
 - Kirti Chakra - Altaf Hussain Bhat (posthumously)
 - Shaurya Chakras – Arun Kumar, Ravi
 - Bar to Sena Medals (Gallantry)
 - Sena Medals (Gallantry)
 - Nao Sena Medals (Gallantry)
 - Vayu Sena Medals (Gallantry)

105. Sirarakhong chilly and Tamenglong Orange are two agricultural product of which state those have been awarded Geographical Index (GI) tag recently?

- A. Sikkim
- B. Manipur
- C. Meghalaya
- D. Nagaland
- E. Mizoram

Ans. B

Sol. • Two famous products of Manipur, namely Hathei chilly, commonly known as the Sirarakhong chilly and Tamenglong Orange have received Geographical Index (GI) tag.

- GI tag is a name given to certain products that have a specific geographical location or origin and gets global recognition.
- Hathei chilly: It is a good anti-oxidant and possesses high calcium and Vitamin C levels.
- Tamenglong mandarin orange: It is bigger in size, weighing 232.76 grams on average. It is a unique sweet and sour flavour.

106. Who was the first Indian to resist the political reforms?

- A. Dadabhai Naoroji
- B. Surendra Nath
- C. Ram Mohan Roy
- D. Bal Gangadhar Tilak

Ans. B

Sol. **Surendranath Banerjee** was the **first Indian** to resist **political reforms**.

- He founded **Indian Association** in **Calcutta**, in **1876**.
- He also **edited magazine 'Bengali'** for the dissemination of **mass consciousness**.
- He was elected as **President of Congress**.

107. Who started construction of Nalanda (Mahavihara)?

- A. Dharampala
- B. Ashoka
- C. Kumaragupta
- D. Harihara

Ans. C

Sol.

- Nalanda Mahavihara was founded by **Kumargupta I** of the Gupta dynasty in 5th century CE.
- Nalanda held some 10,000 students and 2000 teachers when it was visited by the Chinese scholar Xuanzang.

108. Which river does not form a delta?

- A. Ganga
B. Brahmaputra
C. Godavari
D. Tapi

Ans. D

Sol. Tapi River doesn't form a delta. The reason being, the not so steep riverbed which prevents the amount of erosion, and also moreover tidal forces are more prominent on the Gujarat coast which prevents deposition of sediments.

109. The Mediterranean region are characterized by heavy rain in

- A. Autumn
B. Winter
C. Summer
D. Spring

Ans. B

Sol. The **climate** is known for warm to hot, **dry summers** and mild to cool, **wet winters**. ... The cause of this **climate** is directly related to large bodies of water such as the **Mediterranean** Sea and ocean currents

110. Which is **not** an All India Service?

- A. Indian Administration Service
B. Indian Police Service
C. Indian Foreign Service
D. Indian Forest Service

Ans. C

Sol. Foreign service is not an all India service it is a Central civil service. Hence Option C is correct.

111. One third of the members of Rajya Sabha retire _____, and are replaced by newly elected members.

- A. Every second year
B. Every fourth year
C. Every third year
D. Every year

Ans. A

Sol. **Rajya Sabha** or the Upper house is a permanent body not subject to dissolution. **One third** of the members retire every **second** year, and are replaced by newly elected members.

112. The interest rate charged by banks on short-term loans to their largest, most secure and most creditworthy customers is called _____.

- A. Variable Rate
B. Prime Lending Rate
C. Discount Rate
D. Amortised Rate

Ans. B

Sol. • **Interest rate charged by banks on short-term loans to their largest, most secure and most creditworthy customers is called the prime lending rate.**

- PLR rate is calculated based on average cost of funds.
- Non Banking Finance Companies generally price their loan at discount on their existing PLR

113. What effect will a decrease in demand and an increase in supply have on equilibrium price?
- A. Equilibrium price will rise
 - B. Equilibrium price will fall
 - C. Equilibrium price will be constant
 - D. Sometimes price will rise and sometimes it will fall

Ans. B

Sol.

- A demand curve shows the relationship between quantity demanded and price in a given market on a graph.
- The equilibrium price and equilibrium quantity occur where the supply and demand curves cross.
- **When there is a decrease in demand and increase in supply then the equilibrium price falls.**

114. Which animal has three eyes in the world?

- A. Octopus
- B. Tuatara
- C. Cockroach
- D. Crocodiles

Ans. B

Sol.

- **Tuatara animal has three eyes in the world.**
- The lizard-like reptile tuatara has a "well-developed parietal eye, with a small lens and retina".
- Parietal eyes are also found in lizards, frogs and lampreys, as well as some species of fish, such as tuna and pelagic sharks, where it is visible as a light-sensitive spot on top of their head.

115. Which of these alloys consists of mercury as one of its constituents?

- A. Solder
- B. Zinc amalgam
- C. Stainless steel
- D. Alnico
- E. None of the above/More than one of the above

Ans. B

Sol. A homogenous mixture of a metal with a metal or non-metal is an alloy. Amalgam is an alloy that consists of mercury as one of its constituents. Zinc amalgam is an alloy consisting of zinc and liquid mercury.

Alnico is a family of iron alloys which in addition to iron are composed primarily of aluminium (Al), nickel (Ni), and cobalt (Co). They also include copper, and sometimes titanium. Alnico alloys are ferromagnetic and are used to make permanent magnets. Stainless steel is a group of ferrous alloys that contain a minimum of approximately 11% chromium, a composition that prevents the iron from rusting and also provides heat-resistant properties.

Solder is a fusible metal alloy used to create a permanent bond between metal workpieces.

116. When light passes from medium of lower density to higher density, then it moves-
- A. Away from the normal
 - B. Towards the normal.
 - C. Follows straight line
 - D. Depends on other factors and not density

Ans. B

Sol. When light passes from a less dense to a more dense substance, (for example passing from air into water), the light is refracted (or bent) towards the normal.

117. Which cricket stadium in Uttar Pradesh has been renamed after former Prime Minister Atal Bihari Vajpayee on 5th November 2018?
- A. Green Park International Stadium, Kanpur
 - B. Ekana International Stadium, Lucknow
 - C. Saifai International Cricket Stadium
 - D. Noida Cricket Stadium
 - E. None of these

Ans. B

Sol. Uttar Pradesh Government has been renamed newly-built **Ekana International Cricket Stadium in capital city Lucknow after former Prime Minister Atal Bihari Vajpayee.**

- The stadium will now be known as 'Bharat Ratna Atal Bihari Vajpayee International Cricket Stadium'.
- It was announced on 5th November ,2018.
- The Yogi Adityanath Government also renamed Allahabad as Prayagraj and Mughalsarai as Pt. Deen Dayal Upadhyaya.

118. Union Cabinet has recently approved the metro rail projects for which cities in Uttar Pradesh?
- A. Agra
 - B. Kanpur
 - C. Both A and B
 - D. None of these

Ans. C

Sol. The Union Cabinet on 1st March, 2019 approved two **Metro rail projects in Uttar Pradesh's Kanpur and Agra** at an estimated cost of **Rs 20,000 crore** in order to boost urban public transport connectivity.

- The Kanpur project will include two corridors, one from ITT to Naubasta and the other from the Agriculture University to Barra-8. The project's estimated cost is **Rs 12,000 crore.**
- The **Agra Metro** rail project will also have two corridors which will pass through the heart of the city and connect prominent tourist places including the Taj Mahal, Agra Fort, and Sikandra. The estimated cost of the project is **Rs 8,500 crore.**

119. Kabir Mahotsav 2018 was organized in which of the following district of Uttar Pradesh?
- A. Sant Kabir Nagar
 - B. Varanasi
 - C. Mahoba
 - D. Lucknow

Ans. A

Sol. The 'Kabir Mahotsav 2018' was organised at Maghar in Sant Kabir district of Uttar Pradesh to mark the 500th death anniversary of Kabir Das. It was inaugurated by Prime Minister Narendra Modi.

120. Which of the following historical site of Uttar Pradesh comes under the world heritage list?
- A. Buland Darwaza
 - B. Fatehpur Sikri
 - C. Panch Mahal
 - D. Diwan-I-Aam

Ans. B

Sol. **Fatehpur Sikri** is the **UNESCO World Heritage Site** in **1986**. **Fatehpur Sikri** is a town in the **Agra District** of **Uttar Pradesh, India**. The city was founded in the year **1569** by the **Mughal Emperor Akbar the Great**, and served as the capital of the Mughal Empire from **1571** to **1585**, when it was abandoned. The complex of monuments and temples, all in a uniform architectural style, includes one of the largest mosques in India, the **Jama masjid**.

121. From where does the river Ganga enter in Uttar Pradesh?
- A. Bulandshahar
 - B. Meerut
 - C. Bijnor
 - D. Ghaziabad

Ans. C

Sol.

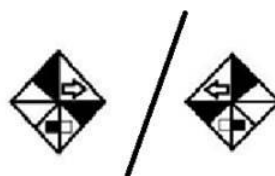
- River Ganga enters in U.P. in District Bijnor.
- It passes through major districts Meerut, Hapur, Bulandshahar, Aligarh, Kanpur Allahabad, Varanasi, Balia, it goes to Bihar.
- The river Ganga originates from Gangotri Glacier at Gomukh and enters India in Uttrakhand.
- It flows through Uttar Pradesh, Bihar, Jharkhand, and West Bengal.

122. Select the correct mirror image of the given figure when a vertical mirror is placed on the right of the figure.



Ans. B

Sol. A mirror image is a reflective duplication of an object that appears almost identical, but is reversed in the direction as right to left and vice versa.



Hence, option (B) is the correct answer.

123. In the following question, select the related letters from the given alternatives.

AEIM : BFJN :: CGKO : ?

- A. DHLP
- B. ZVRP
- C. BCDK
- D. MPQR

Ans. A

Sol.

$A \xrightarrow{+1} B :: C \xrightarrow{+1} D$
 $E \xrightarrow{+1} F :: G \xrightarrow{+1} H$
 $I \xrightarrow{+1} J :: K \xrightarrow{+1} L$
 $M \xrightarrow{+1} N :: O \xrightarrow{+1} P$

A	B	C	D
E	F	G	H
I	J	K	L
M	N	O	P

AEIM : BFJN :: CGKO : **DHLP**

Hence, option A is the right answer.

124. P and Q can do a project in 12 and 12 days respectively. In how many days can they complete 50% of the project if they work together?

- A. 6 days
- B. 3 days
- C. 18 days
- D. 1.5 days

Ans. B

Sol. Let total work be 12 units.

Given: P and Q can do a project in 12 and 12 days respectively.

Then, efficiency of P = efficiency of Q = 1 unit/day

Now, to finish 50% of the total work, i.e. 6 units, they will take = $6/(1+1) = 3$ days

125. The sum of the areas of the 10 squares, the lengths of whose sides are 20 cm, 21 cm,.....29 cm respectively is

- A. 6085 cm²
- B. 8555 cm²
- C. 2470cm²
- D. 11025 cm²

Ans. A

Sol. Required sum = $20^2 + 21^2 + \dots + 29^2$

$$= (1^2+2^2+3^2+\dots+29^2) - (1^2+2^2+3^2+\dots+19^2)$$

$$= \frac{29(29+1)(2 \times 29 + 1)}{6} - \frac{19(19+1)(2 \times 19 + 1)}{6}$$

$$\left[\therefore 1^2 + 2^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6} \right]$$

$$= 8555 - 2470$$

$$= 6085 \text{ sq.cm.}$$
